is in favour of the capture of comets by Jupiter. In fact, the accumulation of these points about $l = 192^\circ$, which is the longitude of Jupiter's aphelion, may be partially explained by the circumstance that at this point Jupiter as well as the comets move more slowly than at perihelion, hence the sphere of attraction of the planet is sensibly extended, and its action exercised for a longer time on bodies moving in its neighbourhood.

The similarity of the elements of many comets is very manifest from the above tables, and M. Schulhof discusses in detail the probable identity of such. During last year Mr. Chandler brought forward evidence that Brooks's comet, V. 1889, was identical with the celebrated lost comet of Lexell, and the latter comet has also been asserted to be identical with that of Finlay, VII. 1886, to which it presents many points of resemblance. It is shown in the discussion that, by computing the orbit of Brooks's comet before 1886, the question of its identity with that of Lexell may be settled, while an extended calculation of the perturbations undergone by Finlay's comet indicates that it could not have been near Jupiter in 1779, and hence it is probably not identical with Lexell's comet. The elements of Finlay's comet are also very similar to those of Vico's comet, I. 1844. In order that the two may be identical, it is necessary that Mars should have augmented the period of Vico's comet by almost two years between 1844 and 1886.

The elements of Denning's comet present a certain analogy with Pigott's comet, but the two are shown to be certainly distinct.

Blainpain's comet, 1819, and that of Grischau, 1743, are most probably identical, and the elements of both these present a strong analogy with those of Tempel's comet, so that it is not impossible that this last comet is identical with the other two, or at least with Grischau's comet.

Whether Coggia's comet, VII. 1873, is identical with Pons's comet, I. 1818, is not settled. It is interesting to remark, however, that the value of $n_j = 0{\cdot}484$, corresponding to a period of 5·67 years for Pons's comet, is exactly equal to that of Biela's comet. This, therefore, appears to confirm the opinion that both Biela's comet and that of Coggia represent the *débris* of an old comet, for, in the case of the division of the materials forming a comet, n_j may be regarded as constant for each of the portions detached.

To decide the question of the identity of Winnecke's with Helfenzrieda's comet, the perturbations undergone by the former towards 1800, when it approached very near to Jupiter, have been found, and it is shown that for the identity to be possible it must have moved faster in its orbit before 1800 than it does now—that is, the period must have been shorter.

This discussion of cometary identities, coupled with M. Tisserand's elaborate investigations, supports strongly Laplace's hypothesis that comets coming from stellar space, and moving in parabolic orbits, only become periodic by the perturbing action of one of the planets. This theory best explains the origin of the families of comets that cluster round the major planets, and the well-established fact of the disintegration of certain periodic comets, as Biela's in 1846, and Brooks's in 1889. Indeed, such disintegration must eventually happen to all periodic comets.

RICHARD A. GREGORY.

THE JOURNAL OF MORPHOLOGY.[1]

THE issues before us constitute the first three parts of the third volume of this excellent journal. They contain 502 pages with numerous plates and a vast number of woodcuts. The chief contribution in the June number is that of Dr. Macmurrich, on "The Actinaria of the Bahama Islands." The author's material was collected during the summer of 1887, in connection with the work of the marine zoological station of the Johns Hopkins University. The monograph forms a very valuable contribution to the literature of the Actiniæ, and it may be regarded as a first step towards a rational comprehension of the tropical members of this group. It is the more welcome to us at the present juncture, in view of the revision of our native Actiniæ now progressing, in the hands of Haddon and his pupils; and we cannot but regard the excellent results obtained by Macmurrich as furnishing an additional argument in favour of the advantages of a peripatetic University marine laboratory, as compared with one of fixed habitat. Fourteen species are described, of which three are new. The illustrations are particularly good, and the following distributional conclusion is arrived at, viz. that

> "so far as the Actinaria are concerned two great areas of distribution can be defined,—the Indo-Pacific, including the Indian and Pacific Oceans and the seas connected with them, such as the Red Sea; and the Atlantic, including in this the Mediterranean. The Caribbean region of the Atlantic is, however, to be separated from the Atlantic region and united with the Indo-Pacific, the relationships of its Actinaria being very certainly with those of that region."

Of the remaining papers in the first part, two are by Dr. R. W. Shufeldt, and they treat respectively of "The Comparative Osteology of the Families of the North American Passeres," and of "The Anatomy of *Speotyto cunicularia hypogæa*." Both communications are written and illustrated in that peculiar style for which their author is notorious. In the first-named paper the author reverts to his recently expressed belief in a near kinship between the swifts and swallows, but he adds nothing of fresh interest in this debated question. His papers bear the mark of honest work, and we wish them a favourable reception.

The last communication is one of 8–9 pages upon the "Variation of the Spinal Nerves in the Caudal Region of the Domestic Pigeon," by J. I. Peck. Although short, it is the outcome of a laborious investigation instituted to ascertain whether the spinal nerves vary in the same ratio as the caudal vertebræ, "or whether they remain constant in number and position of exit from the vertebral canal, without reference to the number of vertebræ themselves." One very interesting result of the author's investigation is the discovery that the coccyx does not diminish in length proportionate to the increase in number of the free caudal vertebræ—on the contrary, it is longest where the said vertebræ are most numerous; therefore, the detachment of the supernumerary vertebræ from the pygostyle would appear to be due to influences at first productive of a lengthening of the entire caudal region. The interest of this topic is vastly increased, on reflection that the assiduity of a Parker has shown us that our swans and ducklings are the bearers of a tail potentially longer than that of the Saururian, Archæopteryx.

In the September issue there are two papers, and each is a valuable monograph of its kind. That which will command most attention is the thesis by Prof. Cope upon "The Mechanical Causes of the Development of the Hard Parts of the Mammalia." To this subject there are devoted 150 pages, 5 plates, and close upon 100 most admirable woodcuts.[1] The paper is, for the most part, an elaborated *résumé* of the author's earlier and scattered contributions upon the subject under discussion; and with

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[1] *The Journal of Morphology*, June to December 1889. (Boston: Ginn and Co.)

[1] We wish we could see this author's voluminous treatises invariably illustrated in a manner similarly befitting their contents. We cannot refrain from comparing the one under review with that on the "Batrachia of North America" recently published under the auspices of the United States National Museum. The illustrations in this are as poor as those referred to above are excellent: carelessly drawn, badly planned, miserably lettered, and in places misleading (if not inaccurate), they "illustrate though they hardly adorn" the text to which they are appended, while they render a large portion of the same of little or no avail for working purposes.

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these he has incorporated the allied work and generalizations of Ryder and other collaborateurs, the whole being woven into a connected argument. The author declares at the outset that he is the more convinced "that it is the habit that has given rise to the structures of animals, and not the structures which have forced animals to adopt their special habits," while he sets himself to discover, "in the light of the descent traced by palæontology, the mechanical causes for the existence of the salient characters of the skeleton and dentition of the Mammalia." The paper abounds in suggestive and ingenious passages, and the author sums up his conclusions in the words:—

> "The general law which we may derive from the preceding evidence is, that in biological growth, as in ordinary mechanics, identical causes produce identical results."

We have, in all, that which savours of rank Lamarckism; and the assiduous author of the remarks we have cited is (as our readers have lately been made aware), clearly, no believer in the non-transmission of acquired characters. He asserts that

> "since the modifications acquired by use during life are necessarily useful, it seems that, according to the post-Darwinians, the only way of acquiring useful variations known to us, is excluded from the process of organic evolution;"

and further, that

> "were this hypothesis true, there would have been no evolution."

Again, he writes,

> "in spite of Weismann's theory to the contrary, so long as the germ-plasma is subject to nutrition, it is subject to influences during the adult life of an animal, and it would be an exception to all other tissues were it not so."

The second and last paper in the September issue is by W. M. Wheeler, upon "The Embryology of *Blatta germanica* and *Doryphora decemlineata*." It is illustrated by seven exquisite plates, which, we are glad to note, are of native (American) origin. In testimony to the thoroughness of the author's work, it need only be said that he professes to be able to tell "just what position any oöthecal egg held in the ovary, or just what position any egg in the ovary will hold in the capsule." Evidence of direct cell-division is adduced, and the author's observations under this head have a most important bearing upon the allied researches of Carnoy. The author records the discovery of the very early appearance and paired arrangement of the Malpighian tubes, and he regards the facts to which he alludes as indicating "that at one time they opened on the surface of the body, and that their orifices were subsequently carried in by a deepening of the proctodæal invagination," and that "probably these tubes in insects are homologous with the anal tubes of *Echiurus* larva, which are modified segmental organs." Gegenbaur, as is well known, long ago postulated such an origin for the excretory apparatus of the Insecta, and Beddard has lately substantiated his belief, on argument from analogy to the Chætopod worms, in which he finds (*Acanthodrilus*) evidences of such an inturning of undoubted nephridia. The author has investigated, among other things, the orientation in oökinesis, and he draws the conclusion that "the force of gravitation has no perceptible effect on the development of the eggs of *Blatta*, but that these highly differentiated eggs, utterly unable to revolve in their envelopes, like the eggs of birds and frogs, have their constituents prearranged, and the paths of their nuclei predetermined, with reference to the parts of the embryo."

In the December number of the journal, Dr. Shufeldt communicates a detailed work "On the Position of *Chamæa* in the System" (28 pp.). In this welcome addition to his previous papers on the smaller Passerines, the author gives a short description of the pterylosis, visceral anatomy, and myology of the bird, and deals at greater length with its skeletal anatomy; he concludes that the Wren Tit is allied to the Bush Tits (*Psaltriparus*) rather than to the true Wrens. Dr. G. Baur rushes into print with two short notes, "On the Morphology of the Vertebrate Skull," and "On the Morphology of Ribs and the Fate of the Actinosts of the Median Fins of Fishes," respectively. In the twelve short pages devoted to the two, the conclusions are arrived at that "the doctrine of the 'otic' bones established by Prof. Huxley twenty-five years ago, and held since that time by nearly all morphologists, is incorrect," and that "the elements of the anal and caudal fins of fishes . . . are represented by the chevron bones of the tail vertebræ, which are the partial homologues of the actinosts." The author's proposal to revive the term "petrosal" for that element now known as the "pro-otic" is especially to be deplored. These notes, although not wholly destitute of merit, are premature. They deal with questions in morphology which have taxed the powers of the greatest anatomists, and which are not to be summarily disposed of in a succession of scrappy communications, any one of which may more or less completely contradict its predecessors. If, in respect to these leading topics, every intelligent inquirer is thus to dogmatically foist upon the public his musings upon facts observed in individual specimens, to say nothing of others pitchforked in second-hand, and which he has therefore not observed at all, what is to become of our already too voluminous literature? We cannot allow to pass unnoticed the contraction of Theromorpha to "Theromora"; life is too short for actions of this kind, even if etymologically justifiable. The remaining contribution is by E. B. Wilson, upon "The Embryology of the Earthworm" (55 pp.). It is an extended account of investigations previously announced in an earlier issue of the same journal; and it is, moreover, very welcome now that current research is revealing in the earthworms an altogether unexpected and intensely interesting range of modification. The author's results raise momentous questions affecting the most important of current morphological beliefs; while largely confirmatory of the recent work of Kleinenberg, they run counter to the same in matters of vital importance, and interest in them is thereby enhanced. The most important topics dealt with are the origin of the mesoblast and the development and morphology of the head (prostomium). The author asserts that Kleinenberg was in error in his account of the origin of the first-named, and he criticizes those facts and deductions which lead him to reject the ordinary conception of the mesoblast as an embryonic layer: he attempts to show that the cerebral ganglia do not arise independently of the rest of the nervous system, and that the cavity of the prostomium is from the first unpaired. These and other lines of investigation have led him to a reconsideration of the annelid Trochosphere, and that he regards as "a secondary larval form," which has "arisen from an elongated segmented ancestral form, . . . the head region or prostomium being enormously developed, . . . and the trunk region more or less reduced." The author confirms Kleinenberg's discovery of the remarkable "cleavage-pore," and suggests a probable significance for the same. He regards both muscular and glandular segments of the nephridia as ectoblastic in origin, and he adduces reason for suspecting that the Hirudinea may formerly have possessed setæ. The last-named is by no means the least suggestive point raised in this excellent paper, which fully realizes the expectations raised by its author in his preliminary note referred to.

We observe that the late publication of this journal, so conspicuous at the outset, is being persisted in. With respect to this, as concerning more than one of their scientific serials, our American brethren are establishing a dangerous precedent for which there is absolutely no excuse; and it is with much dissatisfaction that we note the adoption of a similar course nearer home.

G. B. H.

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